

Project information lighttower
 Decentralised sill ventilation units FSL-B-ZAU
 PI/FSL/9/EN/2



lighttower (DEKA building) · Frankfurt/Main

The building

The lighttower (Deka building) at Hanauer Landstraße in the east dockland of Frankfurt/Main is an architecturally demanding 20-floor office tower with a rentable area of approx. 10.500 m².

The building was erected in 1965 and refurbished in 2004/2005. The intention behind the refurbishment was to create a building for multi-functional use as single, team or open-plan offices. The offices have a depth of 5.50 m – 6.25 m with a modular construction spacing of 1.35 m. In order not to lose any useful floor area, a façade was installed on the exterior of the existing building steelwork skeleton during its renovation, into which a great variety of specific features and functions were integrated.

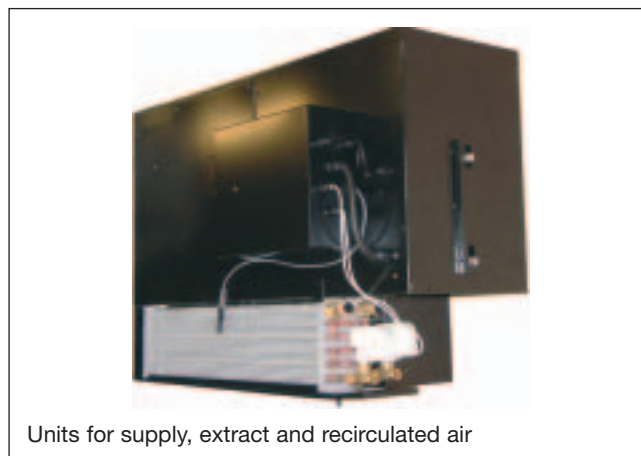
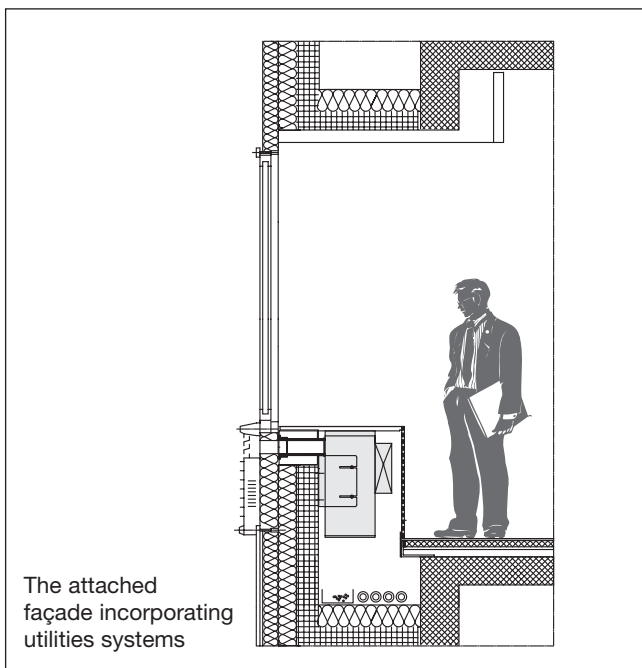
The offices are equipped with openable windows and external electrically operated solar protection. Due to the use of a variable, space-saving room concept utilising decentralised ventilation units and with these units installed on the building modular system, it was possible to plan the building without knowledge of the subsequent room layout. In the case of changes of use, the installed plant in the building can be adapted to new layouts and needs by simply changing parameters in the building management system.

The ventilation concept

The fresh air supply and subsequent extract of air in the office spaces is carried out with decentralised under sill ventilation units type FSL-B-ZAU incorporating functions of supply, extract and recirculation air. In addition to the ventilation function, the system also provides room heating and cooling. In order to increase the heating and cooling capacity in the rooms, circulated air heating and cooling units FSL-B-UML are installed additionally in the interjacent façade axles.

Each unit is equipped with a FSL-CONTROL controller to provide individual control and shut-off. The communication of the units with the building management system is carried out via the LON network.

The supply air, cooling function and extract air for the ground floor and conference floor are provided by an independent central plant together with a chilled ceiling system.

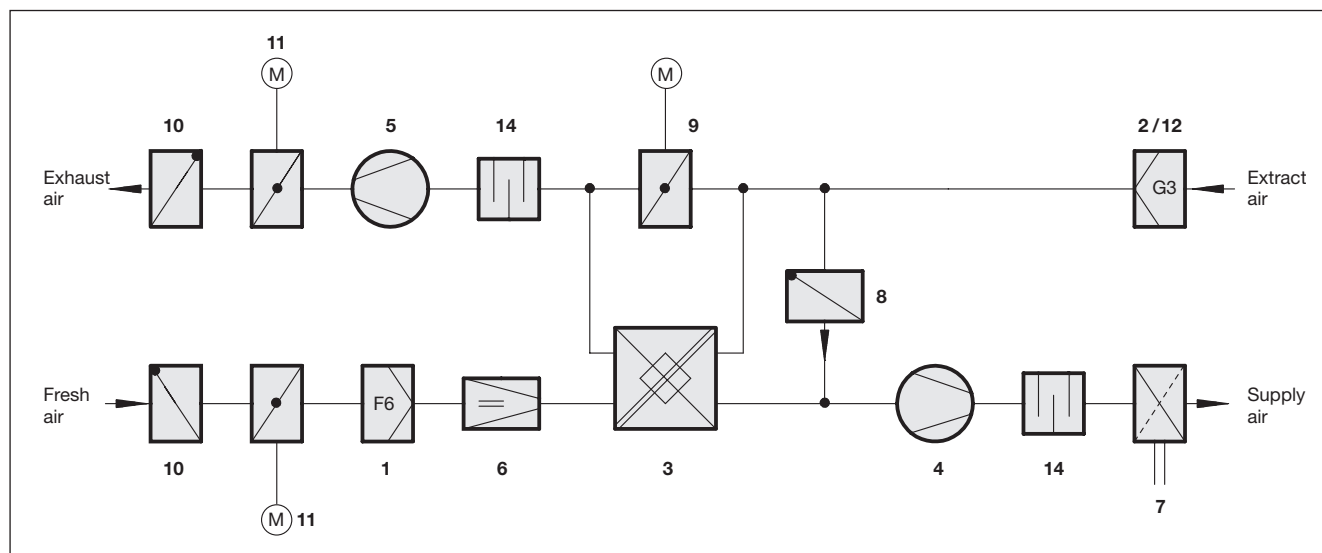


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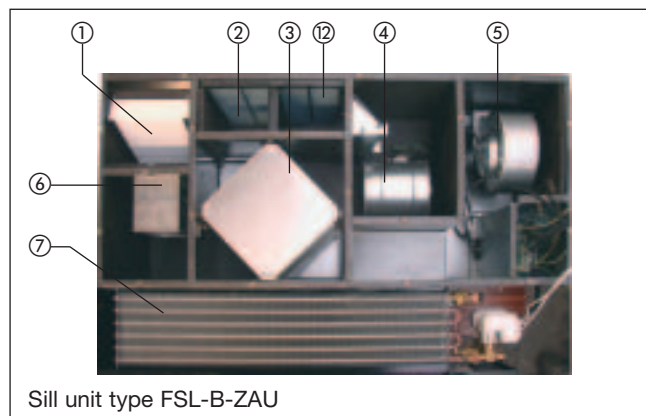
Schematic diagram for type FSL-B-ZAU



- 1 F6 supply air filter
- 2 G3 extract air filter
- 3 Recuperative heat recovery unit
- 4 Supply air fan
- 5 Exhaust air fan

- 6 Flow rate limiter
- 7 Reheat coil
- 8 Automatic recirculation damper
- 9 Motorised bypass damper
- 10 Backdraught damper

- 11 Motorised shut-off damper
- 12 G3 recirculated air filter
- 13 Recirculated air fan
- 14 Attenuator



Sill ventilation units

Construction

The sill units are made of a powder-coated casing of galvanised steel sheet, which is lined with fibreglass mineral wool for noise and thermal insulation. All units contain an aluminum/copper four pipe coil for the heating and cooling function with a condensate tray underneath and are equipped with the FSL-CONTROL system (among other things, this consists of a LON controller, valves and a valve actuator).

Additionally, the air recirculation units contain a radial flow fan for exhaust air as well as a G3 coarse dust filter.

The combined supply, extract and recirculation units have a supply and exhaust air fan and respectively a combination of an automatic backdraught damper and motorised shut-off damper with spring return actuator for the fresh air and the exhaust air.

To filter the fresh air, the units are equipped with a F6 fine dust filter, while the return and recirculated air is cleaned with a G3 coarse dust filter. An automatic flow volume controller is installed for the fresh air. In addition, the units contain a recuperative heat recovery unit with motorised bypass damper. The units are equipped with an automatic recirculation damper to mix recirculated and fresh air.

The filters are easily replaceable after removal of the on site under sill cladding and removal of the inspection cover which is fixed with quick release fasteners.

The reheat coils and the condensate tray can be removed for cleaning purposes. Project-specific fresh and exhaust air spigots as well as assembly elements are provided as accessories, which allow for horizontal and vertical adjustment to take up the building tolerances.

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Principle of operation of the supply, extract and recirculation units (FSL-B-ZAU)

The fresh air enters through inlet spigots integrated into the façade. The automatic backdraught damper in the inlet ensures that outside air does not enter the building when there are negative pressures on the external façade. There is also a motorised shut-off damper with spring return actuator which shuts off the unit when the equipment is shut down or in the case of a power failure. The fresh air is cleaned using a F6 fine dust filter and then passes through an automatic mechanical flow rate controller which limits the fresh air flow rate to a set maximum. Then the air passes through a recuperative heat recovery unit in which part of the heat energy from the exhaust air is transferred to the inlet fresh air. A radial supply fan then discharges the air through a 4 pipe coil with heating and cooling capacity. The air is finally discharged into the room through an under sill slot with a displacement flow characteristic. The extract air is taken from the upper sill area, then passes through a G3 coarse dust filter. After this the extract passes through the recuperative heat recovery unit. When in energy saving mode, in a transitional period or for anti icing protection, a motorised bypass damper is opened which bypasses the heat recovery system. The exhaust air fan produces the necessary pressure differentials for the extract system.

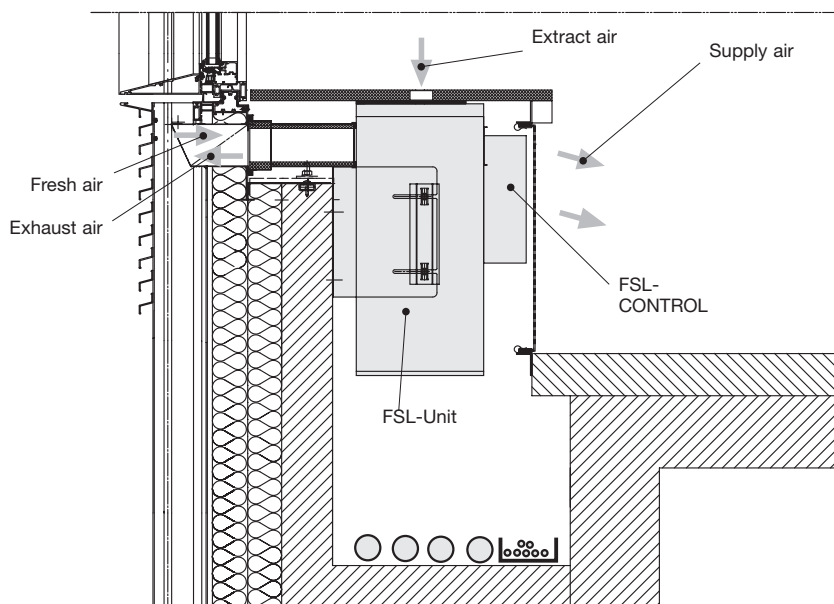
The motorised shut-off damper with spring return actuator closes the exhaust air outlet when the system is shut down or in the case of a power failure. There is also a backdraught damper which prevents reverse flow into the exhaust air outlet when there is a positive pressure on the external façade. The type FSL-B-ZAU units have three operating speeds. The lowest (first) speed provides simple supply and exhaust air operation. Usually, this corresponds to 50 m³/h with 100 % fresh air and exhaust air. For all speed increments on the supply fan the exhaust fan operates to provide a constant 50 m³/h

exhaust air flow. The second and third supply fan speeds result in higher negative pressures on the suction side. The flow rate controller limits the fresh air from outside to 50 m³/h, the automatic recirculation damper passes 50 m³/h (speed two) and 100 m³/h (speed three). The recirculated and fresh air are mixed so that a greater heating or cooling capacity can be achieved.

The room temperature – supply temperature – cascade control can be achieved with units connected by the FSL-CONTROL system. This system provides three automatic modes of operation, in each case with different set point values of room temperature, limiting values of supply air temperature and minimum ventilation rates. The control system regulates the units (fan speeds, dampers and valves) such that the required set room temperature is achieved with a controlled minimum ventilation rate without increasing or reducing the supply air temperature limits. Also frost protection and anti icing protection of the heat recovery unit are incorporated into the FSL-CONTROL system. The room temperature set points can be changed by ± 5 K using the room control units. Additionally, there is a manual control of the fan speeds 1, 2 and 3 and also there is a „STOP“ (speed 0)

Principle of operation of the air circulation units (FSL-B-UML)

The air circulation units type FSL-B-UML are used exclusively for room heating and/or cooling. Similar to the type FSL-B-ZAU units the extract and filtering of room air is achieved in the window sill area. The room supply of heated or cooled air is as before under the sill. The radial flow fan in the unit provides the pressure differential required for the air flow and the 4 pipe heating/cooling system serves to heat and cool the air. The units are regulated by means of an integrated FSL-CONTROL room temperature control consisting of heating and cooling valves, valve actuators and a LON controller.



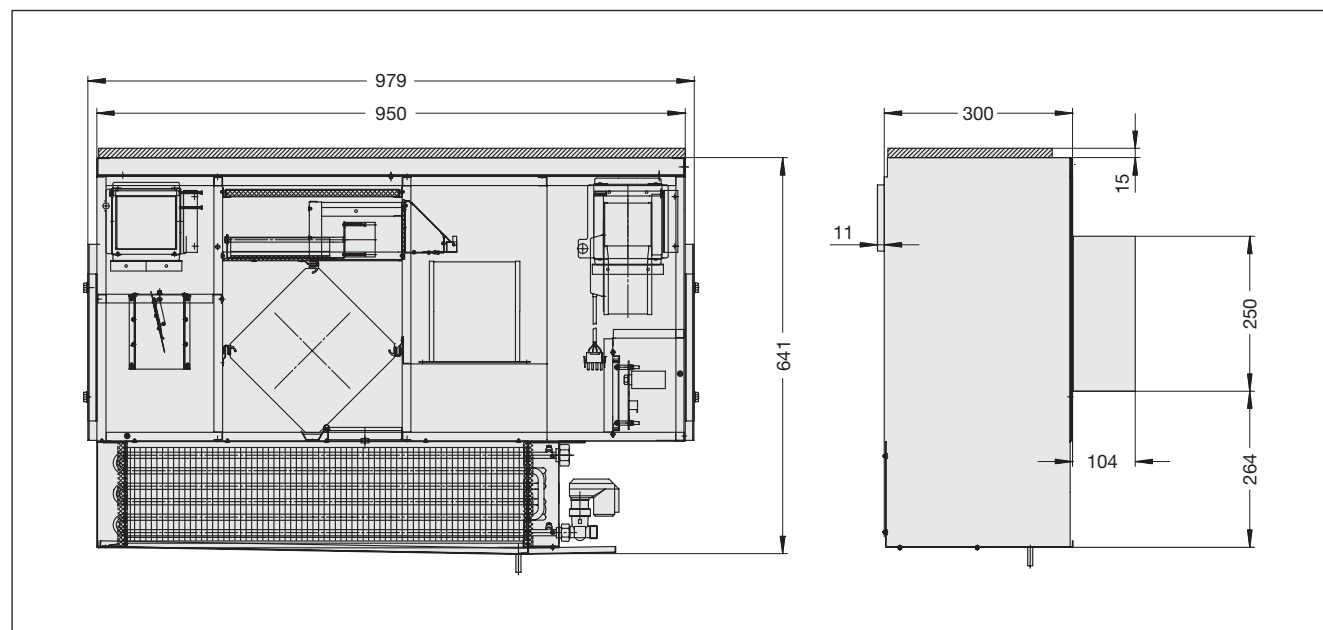
Façade section with integrated sill unit

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Dimensions



Technical Data

The acoustic and flow-related thermal optimisation of the sill units is based on project-specific requirements. The coils are selected based on the performance figures required for the specified volume flows.

The performance data of the units are grouped in the following table.

Speeds		FSL-B-ZAU supply, extract and recirculation unit						FSL-B-UML recirculation unit				
		1		2		3		1	2	3		
		Supply/ extract air	Fresh/ exhaust air	Supply/ extract air	Fresh/ exhaust air	Supply/ extract air	Fresh/ exhaust air	Recircu- lated air	Recircu- lated air	Recircu- lated air		
Volume flow rates		m³/h		50	50	100	50	150	50	100	150	
Cooling	Total cooling capacity	W		479		649		786		243	446	662
	Indoor supply air cooling capacity	W		163		337		500		173	336	500
	Air inlet temperature *	°C		32		29		28		26	26	26
	Supply air temperature	°C		16,2		15,9		16		15,6	15,9	16
	Cold water flow temperature	°C		10		10		10		10	10	10
Heating	Total heating capacity	W		827		956		1107		261	489	650
	Indoor supply air heating capacity	W		250		383		500		37,6	36,6	35
	Air inlet temperature *	°C		-12		5		10,5		22	22	22
	Supply air temperature	°C		37		33,5		32		70	70	70
	Warm water flow temperature	°C		70		70		70		21	26	31
Sound pressure level incl. 8 dB room attenuation		dB(A)		28		31		34		16	19	26
Supply voltage		V		230 V / 50 Hz						230 V / 50 Hz		
Electrical power consumption in operation		W		27		31		36		16	19	26

* Inlet temperature into the reheat coil with heat recovery bypass.